**Model 3: Regulation of the Cell Cycle**

For many years, it was a mystery to scientists how cells controlled their cell division. Scientists now know that the cell cycle is highly regulated by checkpoints that control cell growth and division. These checkpoints can stop the cell cycle and prevent it from dividing when it would be harmful to the organism. When the chemical signals controlling this process fail, very bad things start happening.

#### Part 1 Oncogenes: The bad guys, turn abnormal cell growth on (go/gas pedal)

An oncogene is a gene that has been mutated in a way that leads to signals that cause uncontrolled growth- i.e., cancer. This is like pushing down on a car’s gas pedal- you now have a gene that is telling the cell to "go, go, go!” and never stop.

***Part 2 Tumor suppressor genes***: ***The good guys gone bad***

Tumor suppressor genes in normal cells act as braking signals during phase G1 of the cell cycle, to stop or slow the cell cycle before S phase. If tumor-suppressor genes are mutated, the normal brake mechanism will be disabled, resulting in uncontrolled growth, i.e. cancer.

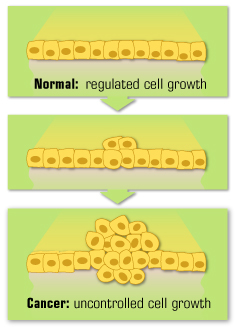
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| http://cisncancer.org/research/images/nci_s51_genomics-rew.jpg  http://cisncancer.org/research/images/nci_s50_genomics-rew.jpg  Oncogenes are mutated genes whose PRESENCE can stimulate the development of cancer. |
| Tumor suppressor genes are normal genes whose ABSENCE can lead to cancer. |
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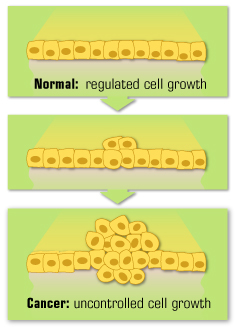
1. What are two types of genes that play a major role in regulating the cell cycle? Describe what effect the genes have on the regulation.

2. What would happen to a cell that experiences a mutation in a tumor-suppressor gene?

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block:\_\_\_\_\_**

**What is Cancer?**

How does a cell “know” when it is time to divide? What controls these events to ensure that the division occurs properly and correctly? These are critical questions to scientists who study the cell cycle because not only do their answers provide insight into normal cell function, their answers help us better understand diseases that arise when the process goes awry.

**Figure A Figure B**

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| --- | --- |
| Normal Cells | Cancer Cells |
| Have external growth factors to divide | Lost need for positive growth factors |
| Contact inhibition – contact with other cells results in stop of cell division | Continue to divide after contact |
| Age and die then replaced in controlled and orderly manner with limited number of divisions | Unlimited number of cell divisions |
| Cease to divide and die when there is DNA damage or when cell division is abnormal | Even with damage to DNA continue to divide even when large amount of damage to DNA or when the cell is abnormal |

3. Cancer cells do not stop dividing. Which picture above demonstrates abnormal cell division? Why?

4. Using the information in Model 3 Table, describe three differences between the cells pictured in the diagrams A and B.